Latin. Added interest is secured by photographic reproductions of pages from the three most complete manuscripts of Robert of Chester's translation. Neither time nor expense has been spared in making the monograph a minute, yet attractive study of the earliest translation into Latin of the famous Arabic text. More profoundly than any other work on algebra that was brought out during the twelve centuries intervening between Diophantus and the Italians, Tartaglia and Cardan has that Arabic text influenced the progress of algebra in the Occident.

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Analytic Geometry. By H. B. PHILLIPS. John Wiley and Sons, New York, 1915. With answers to exercises. vii+197 pages.

The author tells us in his preface that "he has written this text to supply a course that will equip the student for work in calculus and engineering without burdening him with a mass of detail useful only to the student of mathematics for its own sake. . . . If more than the briefest course is given, the best way to spend the time is in working a large number of varied examples based upon the few fundamental principles which occur constantly in practice."

A wise innovation is a brief discussion of the vector, its use illustrated by a few simple problems such as the division of a line in given ratio, the area of a triangle in terms of the coördinates of its vertices, and the location of the center of gravity of a system of weights. But our author straightway abandons this excellent line of procedure and in the sequel has no regard for the directions on any lines other than the coördinate axes. The angle φ "from the positive direction of the x-axis to the line MN," as used here, is the least positive angle that can so be measured. If two lines L_1 and L_2 make with the x-axis the angles φ_1 and φ_2, then the angle β from L_1 to L_2, according to the text (p. 41), is $\varphi_2 - \varphi_1$ in every case. But if $\varphi_1 > \varphi_2$, this angle is obviously $180° + \varphi_2 - \varphi_1$, unless we regard β as then negative, contrary to custom and contrary to our author himself in the very first application he makes of the familiar formula for tan β (Ex. 3, p. 41. The angle from AB to AC is negative according to the definition of β on p. 41.) It seems to me a matter of regret that the teacher in his class room should accept without comment as to general validity a demonstration based merely on the most obvious geometrical construction. That this careless attitude should find place in our textbooks is a matter for serious concern.

In Art. 26 it seems to me that we have the distance from the line $Ax + By + C = 0$ to the point (x_1, y_1) rather than the distance from the point to the line, but since we are told that such a sign must be used with $\pm\sqrt{A^2 + B^2}$ that the result be positive, this is a matter of little moment.

The definitions of fundamental curves and their properties deserve mention. The slope of the line determined by the points (x_1, y_1) and (x_2, y_2) is *by definition* $m = (y_2 - y_1)/(x_2 - x_1)$, the term inclination is not used. As working tools, one uses only two forms for the rectangular equation of the straight line, $y - y_1 = m(x - x_1)$, and $y = mx + b$. The ellipse is obtained through deformation of

the circle, and it is noted that the ratios obtained by dividing the squares of the distances of any point on the ellipse from the axes by the squares of the parallel semi-axes, have a sum equal to 1. The parabola is defined directly as the locus of points the squares of whose distances from one of two perpendicular lines are proportional to their distances from the other, while the hyperbola is the locus of points the product of whose distances from two lines is constant. This makes possible, without any mention of transformation of coördinates, the derivation of the equations of these curves with any arbitrary pair of perpendicular lines as axes, and leads immediately to a simple classification of the types of curves represented by the general equation of the second degree.

Chapter 5 begins with an excellent discussion of the standard methods of sketching the graph for an algebraic equation. Article 40 on the direction of a curve near a point is notable, since it is the nearest approach to mention of a tangent line to be found in the book. Any discussion of tangent lines is left for the calculus. Such topics as diameters, poles and polars, and their ilk, are also absent. There is a brief discussion of trigonometric and exponential curves, and in the section on empirical equations there are examples of each of the four types $y = mx + b$, $y = ax^2 + bx + c$, $y = ax^n$, and $y = ab^x$.

In the chapter on polar coördinates we find the one time familiar definition of a conic as "the locus of a point moving in such a way that its distance from a fixed point is proportional to its distance from a fixed straight line." Its equation in polar coördinates is changed to rectangular coördinates and the ellipse, hyperbola and parabola are discovered as conics. In the section on the intersection of curves, care is taken to point out that a point may lie on a curve although its coördinates (as given) do not satisfy the equation of the curve. The illustrative example is correct if $a = 1$.

A chapter on parametric representation and one on transformation of coördinates close the portion of the book devoted to plane geometry. A single page is given to the discussion of the general equation of the second degree. As noted above, we already have working rules for the determination of the nature of the locus. The concluding three chapters (32 pages) are devoted to the geometry of space of three dimensions. The vector is again discussed and the equations and properties most frequently needed for the line, the plane, the conicoids and simple curves are brought out. The locus problem is introduced early in the text and is brought in again and again, fixing new principles by repeated use. The problem lists are frequent and extended.

The author seems to have put into this text about what he might offer to his own classes and to have added comparatively few topics merely for the sake of making a complete treatment. This should make the book usable from the point of view of the teacher. One who is looking for a drill course on "the few fundamental principles which occur constantly in practice" should consider this book.

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